

To: Malcolm Johnston

From: George P. Edmonds, Jr.

Date: 30 October 1969

Subject: Shutdown of the PGNCS on the Lunar Surface

References: (1) Apollo 12 Flight Plan 8 September 1969
(2) Apollo Mission Techniques H-1 Lunar Surface
15 October 1969
(3) E-1142 Rev. 56

Introduction

The LM PGNCS may be shut down on the lunar surface. Ref. 1 calls for placing the IMU in STANDBY and the LGC in STANDBY. Ref. 2 calls for IMU STANDBY but LGC OFF. This memo will point out considerations applicable to both procedures and give special information for LGC STANDBY and OFF. Significant changes from the original are indicated in this revision by a line in the margin.

Information Applicable to Any PGNCS Power Down

1. Turning IMU operate OFF saves about 200 watts. Ref. 3
2. The IMU should be in operate for at least 1 hour before use for precise measurements. Ref. 2 calls for 15 minutes between IMU operate ON and the first P57. 0.5 cm/sec^2 PIPA bias could exist at this time.
3. A Hardware restart occurs when the LGC is brought from STANDBY or OFF to OPERATE. The restart light may or may not light in either case.

Information Applicable Only to Power Down With the LGC in STANDBY

1. Turning computer operate OFF saves 56 watts, but 34 watts of power will still be used by the LGC. (Ref. 3)
2. The LGC clock will update properly after 23 hours or less in STANDBY. Ref. 1 calls for a longer time than this in STANDBY. Therefore a brief turn on to operate is required.
3. In LGC STANDBY, the STANDBY light is ON*.
4. The LGC warning light is not normally ON in STANDBY.

*The lights will go OFF if S/C power is removed from the DSKY.

Information Applicable to Power Down With the LGC to OFF

1. 34 additional watts are saved. (Ref. 3)
2. The LGC clock will stop and updating will be required at turn ON.
3. The LGC warning light will be ON while the LGC is OFF. (An OFF-ON-OFF sequence is possible during turn ON.)
4. To preserve instrument calibration, the IMU should be "parked" at turn OFF in the same attitude used on the earth to $OG = 0$, $IG = 0$, $MG = 90^\circ$, (Modest vehicle tilt will not be harmful).
5. When the IMU is "parked" the No "Attitude" and "Gimbal Lock" light will come ON and stay ON*. (Special procedures are available to turn the lights OFF.)
6. If the LGC is powered down to OFF and the IMU is parked as in 4 above, 15 minutes with LGC STANDBY or OPERATE is required before IMU OPERATE power is applied. If the IMU is not parked 2 hours is required.

Conclusions

Turning the IMU OFF and the LGC to STANDBY provide considerable power savings without unreasonable operational constraints. However, the additional savings achieved by turning the LGC to OFF do not seem to compensate for the requirements for parking and the associated delays and updates after turn ON.

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